

(ii) *Inflation*, UL 1517, section 14.3 through 14.5 using a PFD with each automatic inflation mechanism disabled.

(iii) *Inflated flotation stability*, UL 1517, section 15, for Type II and Type III performance except comparisons are to be made to the appropriate size and Type reference vest as defined in §160.077-2(j).

(4) *Water Emergence*, UL 1517, section 16.

(5) *Operation Force Test*, UL 1517, section 17.

(6) *Buoyancy, buoyancy distribution, and inflation medium retention test*, UL 1517, sections 18 and 19, except:

(i) Recreational hybrid inflatables must provide minimum buoyancy as specified in Table 160.077-15(b)(13):

(ii) The buoyancy and volume displacement of kapok buoyant inserts must be tested in accordance with the procedures prescribed in §160.047-4(c)(4) and §160.047-5(e)(1) in lieu of the procedures in UL 1517, section 18 and 19.

(7) *Inflation Chamber Tests*.

(i) *Over-pressure Test*, UL 1517, section 28.

(ii) *Air Retention Test*, UL 1517, section 29.

(8) *Temperature Cycling Tests*, UL 1517, section 23.

(9) *Solvent Exposure Test*, UL 1517, section 24.

(10) *Environmental Tests*, UL 1517, section 31.1.

(i) *Humidity Exposure*, UL 1517, section 31.4.

(ii) *Rain Exposure*, UL 1517, section 31.2 and 31.3.

(11) *Abrasion/Compression Test*, UL 1517, section 26.

(12) *Water Entrapment Test*, UL 1517, section 20.

(13) *Tensile Tests*, UL 1517, section 22.

(14) *Strength of Attachment of Inflation Mechanism*, UL 1517, section 30.

(15) *Flame Exposure Test*, UL 1517, section 25.

(16) *Impact Test*, UL 1517, section 21.

(17) *Seam Strength Test*, UL 1517, section 33.

(18) *Puncture Test*, UL 1517, section 27.

(c) *Visual Examination*. One complete PFD must be visually examined for compliance with the requirements of §160.077-15.

(d) *Inflation Chamber Properties*—(1) *General*. The tests in this paragraph must be run if the tests in paragraph (b) of this section are successfully completed. The results of these tests will be used to check the quality of incoming PFD components and the production process. Test samples must come from one of more PFD's that were each used in all of the tests in paragraphs (b)(2), (b)(6), (b)(7), (b)(16), and (b)(18) of this section.

(2) *Grab breaking strength*. Grab breaking strength of chamber materials must be determined according to Method No. 5100 of Federal Test Method Standard 191, or ASTM D 751 (incorporated by reference, see §160.077-5).

(3) *Tear strength*. Tear strength of chamber materials must be determined according to Method No. 5132 or 5134 of Federal Test Method Standard 191, or ASTM D 751 (incorporated by reference, see §160.077-5).

(4) *Permeability*. The permeability of chamber materials must be determined according to ASTM D 1434 (incorporated by reference, see §160.077-5) using CO₂ as the test gas.

(5) *Seam strength*. The seam strength of the seams in each inflation chamber of at least one PFD must be determined according to ASTM D 751 (incorporated by reference, see §160.077-5), except that 25 mm by 200 mm (1 in. by 8 in.) samples may be used where insufficient length of straight seam is available.

(e) The Commandant may prescribe additional tests, if necessary, to approve unique or novel designs.

[CGD 78-174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78-174, 60 FR 2487, Jan. 9, 1995; USCG-2000-7790, 65 FR 58463, Sept. 29, 2000]

§ 160.077-21 Approval Testing—Type I and Commercial Hybrid PFD.

(a) *General*. This section contains commercial hybrid PFD approval tests. The provisions of §160.077-19(a) apply to each test in this section.

(b) *Tests*. Each test prescribed in §160.077-19(b), except the tests in paragraphs (b)(2), (b)(3)(i), (b)(3)(ii), and (b)(6), must be conducted and passed.

(c) *Additional tests*. Each PFD design must also be tested according to the

§ 160.077-23

46 CFR Ch. I (10-1-11 Edition)

procedures in the following tests and meet the requirements in these tests:

(1) *Jump test*, UL 1517, section S6 for Adult size. Youth and Small Child sizes are exempt from this test.

(2) *In-water removal*, UL 1517, section S9 for Adult and Youth sizes. The Small Child size is exempt from this test.

(3) *Buoyancy and inflation medium retention test*, UL 1517, Section S10, except the minimum buoyancies must be as specified in the Table 160.077-17(b)(11):

(4) *Flotation stability*.

(i) *Uninflated flotation stability*, UL 1517, section S7, except that for Type I devices the requirements of paragraph S7.1.A apply to all subjects regardless of their in-water weight. For Type V adult-size devices the requirements of paragraph S7.1.A apply to all adult subjects having an in-water weight of 13 lb or less, and the requirements of paragraph S7.1.B apply to all other adult subjects.

NOTE: —If the freeboard of a test subject is close to zero, caution must be taken to prevent the subject from inhaling water. The subject may use lightweight breathing aids to avoid inhaling water.

(ii) *Righting action test*, 46 CFR 160.176-13(d)(2) through (d)(5) for Type I hybrid PFDs. UL 1517, Section S8, for Type V hybrid PFDs.

(5) *Flotation stability—youths and small children*.

(i) *Uninflated flotation stability*, UL 1517, section S7, except that the requirements of paragraph S7.1.A apply to all subjects regardless of their in-water weight.

(ii) *Righting action test*, UL 1517, Section 15.3 through 15.13, for Youth and Small Child hybrid PFDs except comparisons are to be made to the appropriate size and type reference vest as defined in §160.077-2(j).

(d) *Flotation Stability Criteria*. At the end of the righting action test—

(1) At least 75% of the PFD's retroreflective material on the outside of the PFD, and the PFD light, must be above the water when the subject is floating in the stable flotation attitude; and

(2) The subject when floating in the stable flotation position and looking to the side, must be able to see—

(i) The water no more than 3 m (10 ft.) away; or

(ii) A mark on a vertical scale no higher than the lowest mark which can be viewed when floating in the same position in the reference vest defined in §160.077-3(j).

(3) Each adult test subject must have a freeboard of at least:

(i) 100 mm (4 inches) if the PFD being tested is to be approved as a Type I hybrid PFD; or

(ii) 120 mm (4.75 inches) if the PFD being tested is to be approved as a SOLAS lifejacket.

(e) *Visual Examination*. One complete PFD must be visually examined for compliance with the requirements of §160.077-15 and §160.077-17.

(f) *Inflation Chamber Properties*. If the tests in paragraphs (b) and (c) of this section are completed successfully, the tests in §160.077-19(d) must be run.

(g) The Commandant may prescribe additional tests, if necessary, to approve unique or novel designs.

[CGD 78-174, 50 FR 33928, Aug. 22, 1985, as amended by CGD 78-174, 60 FR 2488, Jan. 9, 1995; 60 FR 7131, Feb. 7, 1995; CGD 95-072, 60 FR 50466, Sept. 29, 1995]

§ 160.077-23 Production tests and inspections.

(a) *General*. (1) Production tests and inspections must be conducted in accordance with this section and subpart 159.007 of this chapter.

(2) The Commandant may prescribe additional production tests and inspections if needed to maintain quality control and check for compliance with the requirements of this subpart.

(b) *Test and Inspection Responsibilities*. In addition to responsibilities set out in part 159 of this chapter, each manufacturer of a hybrid PFD and each independent laboratory inspector must comply with the following, as applicable:

(1) *Manufacturer*. Each manufacturer must—(i) Perform all required tests and examinations on each PFD lot before the independent laboratory inspector tests and inspects the lot, except as provided in §160.077-23(d)(5);

(ii) Perform required testing of each incoming lot of inflation chamber material before using that lot in production;